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Analysis of this product shows that the manufacturer has not profited by his former mistakes, but has repeated them all, with one addition—the strawberries have been left out.

These products are adulterated and misbranded. The use of the terms "glucose jelly" or "glucose jam" would only partially remedy the matter. The use of the term "imitation" would more nearly express the whole truth. To express the whole truth, the truth to which the purchaser is entitled, this word should be followed by some such statement as this, "Made from corn sirup, apple trimmings, strawberries and phosphates, and colored with a coal-tar dye."

UNIVERSITY OF KANSAS, LAWRENCE.

A METHOD FOR THE DETERMINATION OF STARCH.

WALTER S. LONG.

THE METHODS available for starch determinations may be classified under three heads: Polariscopic, reduction, and colorimetric methods. In all polariscopic and reduction methods starch is hydrolyzed to dextrose, and any method of this kind is subject to the errors involved in hydrolysis and in polarization or reduction, as the case may be. These methods, even when most carefully conducted, are incapable of yielding anything like accurate results. The results invariably come out too low, due on the one hand to the incomplete conversion to dextrose, on the other to overconversion, giving rise to condensation products having a much less or no cupric-reducing power. As to the accuracy of reduction methods it has been shown by various chemists that in calculating starch from dextrose the theoretical value is never obtained, the actual results being from 95 to 98 percent of theory.

Regarding colorimetric methods it is claimed that "while the methods are short and convenient, the results obtained are only roughly approximate." Several methods have been proposed for the direct estimation of starch, such as precipitation with a solution of iodine or barium hydroxide, but none of these methods has yielded trustworthy results.

In working with such products as jams and jellies many samples were found to contain small amounts of starch—too small for satisfactory determinations by any methods available. It seemed desirable to develop a method, if possible, which would prove sufficiently accurate for such purposes.

The work along this line up to date has been confined to starch solutions, the thought being that any method giving accurate results on such solutions might be made applicable to the estimation of starch in various food products by suitable modifications.

Upon investigation it was found that when equal volumes of a starch solution were treated with equal volumes of iodine solution in the presence of potassium iodide and in amounts greater than the equivalent of the starch present, the latter was completely precipitated, and upon filtering and washing with potassium iodide solution, filtrates were obtained containing equal quantities of iodine. These facts suggested the possibility of a volumetric method similar to that used in the determination of the iodine number of fats. Such a method, however, would obviously involve the removal of the halogenated starch before titration.

A number of trials were made upon starch solutions of different concentrations to determine whether the absorption of iodine was affected by concentration, and also to determine whether duplicate determinations would give concordant results.

Some of the results on duplicate determinations were as follows: For a 1 percent starch solution the titration figures for unabsorbed iodine were 3.35 and 3.20; for a 0.5 percent solution, 8.50 and 8.50; for a 0.1 percent solution, 4.72 and 4.80; and for a 0.05 percent solution, 17.83 and 18.40. These results were sufficient to show this fact—that in the case of any one solution of starch, equal quantities of starch absorb equal quantities of iodine, and further, that unabsorbed iodine could be recovered. The point as to whether concentration has any effect upon the absorption was readily determined by reduction to a common basis of the results obtained for absorbed iodine in the individual cases. It was found that with sufficient care in precipitation and washing of precipitates, especially in the case of the more concentrated solutions of starch, results were obtained which approximate the figures 0.00125, this representing the grams equivalent of starch per 1 cubic centimeter of 1/500 normal iodine solution.

This factor was used in calculating some results obtained by the following method:

To 5 cc. of starch solution in a 100 cc. flask add 5 cc. of a 5 percent solution of potassium iodide and 20 cc. of N/500 solution of iodine (in 5 percent potassium iodide solution). Stopper the flask, shake and let stand over night. Filter off the precipitated starch iodide and wash the precipitate thoroughly with 5 percent potassium iodide solution. Titrate the filtrate and washings with N/500 sodium thiosulphate solution, with the addition of some starch solution as indicator. Run controls using the same amounts of reagents, but omitting the starch.

Some of the results obtained are tabulated as follows:

Starch in Starch Solutions.

Known, percent.	Found, percent.	Difference, percent.
1.00	1.09	+0.09
1.00	1.09	+0.09
0.50	0.42	—0.08
0.50	0.41	—0.09
0.50	0.48	—0.02
0.25	0.21	—0.04
0.25	0.20	—0.05
0.10	0.14	+0.04
0.10	0.11	+0.01
0.10	0.12	+0.02
0.10	0.11	+0.01
0.10	0.11	+0.01
1.10	0.11	+0.01
0.10	0.10	0.00
0.10	0.08	—0.02
0.10	0.08	—0.02
0.04	0.031	—0.009
0.04	0.031	—0.009
0.068	0.058	—0.010
0.068	0.062	—0.006
0.068	0.065	—0.003

The applicability of the method to the determination of starch in various food products has not yet been determined.

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